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THE ORIGIN AND DEVELOPMENT OF PLANT AND ANIMAL INSTINCTS.

A Theory of Evolution in which Life is the Central Agent.

By LYMAN C. WOOSTER, State Normal School, Emporia.

THE study of the origin and development of plant and animal instincts is inseparable from the larger study of the origin and development of the plant and animal kingdoms; that is, of their evolution. After fifty years of searching investigation of all phases of the doctrine of evolution of plants and animals, most naturalists are agreed that the evolutionist must solve four problems before he can claim that his theory is fully established. These problems are: variation, heredity, natural selection or adjustment to environment made from without through the destruction of the less fit, and segregation, or speciation, brought about through the separation of varieties by some natural barrier that prevents their mixing.

The potency of natural selection in cutting out the ill-adapted has been so abundantly demonstrated by Darwin, Wallace and others that many, for a time, thought that the solution of this problem carried with it the solution of the other three problems, and therefore established the doctrine of evolution of plant and animal life. This is now known to be an error, though many still cling to it.

Speciation by segregation has likewise been abundantly proved in this country by David Starr Jordan, O. F. Cook, C. H. Merriam, J. A. Allen, A. E. Ortman and others, and by many biologists across the Atlantic. This, the fourth problem, may therefore be laid aside as solved. Hugo de Vries, of Amsterdam, however, claims to have found another method of speciation, that of mutation, according to which a species is believed to spring into existence fully formed, but, as this method involves a freak or sport in variation and heredity, mutation must be referred to problems one and two.

The first and second problems, variation and heredity, still remain among the questions that persistently plague the naturalists. Outside influences and inner tendencies are respectively appealed to by opposing schools of biologists to account for variation; and heredity in its essence is acknowledged by all biologists to be in some measure a mystery.

In investigating the origin of instincts, I have been involved in these two problems and have been forced to propose a solution which is more or less in accord with the beliefs of the Neo-Lamarckians. My conclusions constitute the body of this paper.

THE THESIS.

Life on earth has been endowed from the beginning with at least seven powers or modes of activity. Three are concerned in nutrition and respiration, one enables life to reproduce its kind and multiply individuals, and the remaining three powers enable life to adjust itself to its environment, the last of these three being the power which makes it possible for life to do its work better to-morrow than it has done it to-day.

Life, in exercising this, its seventh power, or form of activity, did all its work consciously on the first day of its existence on earth, then, after some millions of years of earth experience, it did some of its work consciously, some habitually, and some reflexively and instinctively, all of which, the habitual, the reflexive, and the instinctive, had before been done consciously. Thus life makes provision through consciousness and the development of its reflexes and instincts for better and different adjustments to its environment, and in doing so may evolve higher and still higher types of organisms in the succeeding generations.

This fixation of conscious forms of activity, first as individual habits, then as race habits, or instincts and reflexes, and the growth or development of instincts and reflexes through conscious pioneer work, explains variation and heredity, the two hitherto unsolved problems of development, and therefore completes the establishment of the doctrine of plant and animal evolution. The attempted explanation by Weismann of heredity and variation by means of a hypothetical germ plasm consisting of biophors and determinants is entirely unsupported by observation, and assigns to matter qualities not dreamed of by any chemist or physicist while studying this entity. Life alone manifests the tendencies assigned to matter by Weismann. By substituting "life" for "germ plasm" with its biophors and determinants, the chief objections to his hypothesis are removed. Weismann admits that this substitution may properly be made, though he naturally prefers his germ plasm as the variant and bearer of hereditary qualities.

THE ARGUMENT.

Before considering the evidence in favor of the "life theory of evolution," we should remember that the term "instinct" belongs to biology, and refers to the power of life to do without present conscious effort many things necessary to the well-being of the individual; and that the ability to establish reflex activities enables life to make many mechanical sequences without conscious effort or direction. We must also remember that psychologists are now agreed that the mainspring of action lies in the sensibilities and not in the intellect, and that the syllogism cannot be used to test the truthfulness of the emotions. Therefore, an action may be felt to be necessary by the lower organisms when it cannot be thought to be necessary.

How life influences energy and matter without being itself a form of energy is one of the problems of philosophy for which many solutions have been offered, none of which are entirely satisfactory. No one, however, any longer believes in a vital force, though the biologist knows of many chemical transformations managed by life in protoplasmic cells which are beyond the power of our most eminent chemists to effect, and no machine constructed by our most skillful mechanics can approach in efficiency the human body built by the body-building instincts.

It should also be explained that no attempt will be made in this paper to find an explanation of the origin of the protoplasmic cell. Paleontology is necessarily silent as to the origin of this biologic unit, there is no known chemical laboratory where living protoplasm is being elaborated, and embryology finds that the embryos of the metazoa, in recapitulating the life history of their ancestors, invariably begin their development in a single protoplasmic cell which is either a conjugate of two cells or is an unfertilized cell.

In establishing the truth of this thesis, I wish to show first that it is in harmony with common experience. All are aware of the fact that conscious repetition of a certain mode of activity so impresses that form of action on the individual that it becomes a habit and may be repeated with a minimum of conscious direction thereafter. What is more natural than to believe that these habits persisted in by succeeding generations become permanent attributes of life and are established in time as race habits or instincts and reflexes. To fix an individual habit requires years of repetition; to establish a race habit must evidently require many centuries of effort.

In saying that race habits are established, I do not mean to say that they are fixed as a whole, but that they pass through stages of development, and are first in their infancy, then in their youth, then are adult, and, finally, may develop to higher levels or may slowly decay when they cease being useful.

These race habits, or instincts and reflexes, are known to function as body-building and body-using activities long before the conscious powers of the embryo are awakened; but this does not imply that instincts precede consciousness in evolution. Life may repeat the major, conscious, body-building experiences of the ancestors of the embryo in an instinctive way in producing body-structures, and then quicken the conscious powers of the individual at birth to meet the varying conditions of the environment and to seek better ways of living; but there could have been no instincts and reflexes at first, unless they were received from Jehovah. All work must have been pioneer work, and therefore work done consciously, if life came unequipped with earth-conquering habits from the hands of its creator.

If we desire the formality of a course of reasoning before we are willing to accept life with its many possibilities, we should remember that we gain truth in two distinct, though related, ways. The evidence of our five senses, if confirmed by many repetitions, is usually regarded as affording a satisfactory basis for action in those things that can appeal to the senses. But there is a very large field open to human investigation that lies beyond the world of sense, though contiguous to it. Here any theory that enables one to explain things is pragmatically true. In chemistry and physics, for example, the atom, the molecule, and energy and ether are concepts not derived from sensations, yet the chemist and physicist base their systems of chemical and physical theory on the actuality of these non-sensuous entities. The uncounted millions invested in manufacturing enterprises are so invested because the entire business world believes in the truthfulness of the theories embodied in chemistry and physics. These, in turn, are held by all scientists to be true because of their pragmatic value, though the atom, molecule, energy and ether cannot be grasped by their senses.

The biologist, in a similar way, accepts life as the basic entity in the world of organisms, though his senses take in no direct information concerning life and its essential qualities. By experience and observation he knows what it is to be alive, and he has learned that in some way, not revealed by his five senses, life controls matter through energy, whenever it is associated with these entities in living organisms. How energy influences matter, and how life influences energy, neither the biologist nor the physicist at present knows, but the fact of such control is patent to all observers.

Unfortunately, however, for the satisfaction of those mathematically inclined and the peace of mind of the biologist, life manifests in all its activities a conscious power which is a variable, a power that observes no physical law except when it needs to do so for its own highest good. Because life does not conform to such invariable laws as energy and matter, many physicists and mathematical biologists deny the existence of any such entity as life, and list it as a quality or property of matter, or as a form of energy not yet studied sufficiently to determine its laws.

Those who are biologists in spirit as well as in name, on the other hand, declare that life is as truly an entity as are energy and matter, and is just as necessary to any system of biology as are energy and matter to physics and chemistry. They declare, further, that evolution would be impossible did not life exist and possess conscious powers; for life must pioneer its own way in its earth environment, and, when best ways are discovered, it must fix its tendencies accordingly, first as individual habits, and second, after long trial by many generations of descendants, fully establish them as race habits, or instincts and reflexes, and transmit them by heredity.

This theory of evolution, with life as the central agent, as presented in this paper, merely assigns life to its natural place in the plant and animal kingdoms. Instead of ascribing to matter certain properties not usually considered as belonging to this substance, or giving to energy autocratic command in the cosmos, it places life at the head of these entities and gives it the power to manage matter through energy when these three are associated in plants and animals.

Why life was placed on earth to develop its powers; why it did not in the beginning inherit all the powers of Jehovah, are things the future alone can reveal to us; but of this we may be certain: continued and successful development is one of the life possibilities to him who labors for it and consciously chooses that which is best for his neighbor as well as for himself.